REMARKS

Claims 1-11, 13 and 15-18 are currently pending in this application, Claims 12 and 14 having been canceled.

Claims 1-11, 13 and 15-18 have been rejected under 35 U.S.C. §103(a) as unpatentable over Isomura et al (U.S. Patent No. 5,741,474) in view of Schuessler et al (EP 0 878 442, to which a U.S. Patent No. 6,428,758 is a counterpart). However, for the reasons set forth hereinafter, Applicants respectfully submit that all claims of record in this application distinguish over both Isomura et al and Schuessler et al, and are allowable. (Applicants' comments as set forth herein are referenced to the U.S. '758 equivalent to the EP Schuessler et al reference.)

The present invention is directed to a device for evaporating a liquid for a reactor that has a plurality of chambers for carrying out a solid-catalyzed reaction, each of the latter chambers including therein a catalyst material. A common evaporating unit for evaporating liquid starting materials is provided in thermal contact with the plurality of reaction chambers, which constitute the catalytic reactor. According to a feature of the invention, as recited in Claim 1, the portion of the evaporation unit in which evaporation of the liquid starting materials substantially takes place is "at least partially surrounded by the

plurality of chambers", each of which contains the catalyst material, and which collectively form the reaction chamber. Claim 15 is similarly limited, reciting that each of the chambers "contain[s] a catalyst material that is used in said catalytic reaction", and that an interface between the evaporator unit and the catalytic reactor is three dimensional, such that the evaporator is at least partially surround by the plurality of chambers. The latter features are neither taught nor suggested by either of the cited references.

Isomura et al, in particular, discloses a process and apparatus for producing high purity hydrogen in which methanol, water and air are input to a vaporization chamber 10 that is heated by a heater unit 9, as noted at Column 4, lines 39-51. From there, the evaporated starting materials pass to a reforming chamber 11, where they undergo reforming and partial oxidation in the presence of the catalyst 12. The hydrogen gas generated by these reactions enters the separated gas chamber 14 via a hydrogen permeable membrane 13, and is recovered via a path 15.

The Office Action states at paragraph 3 that Isomura et al discloses apparatus which includes a plurality of chambers containing catalysts 12. However, based on the foregoing brief description, and based on a review of Figure 1, as described at Column 4, line 19 through Column 5, line 25, and especially Column 5, lines 9-19, Applicants respectfully submit that the Isomura

et al apparatus does not include a plurality of chambers which comprise a catalyst, as recited in Claims 1 and 15. In this regard, the Office Action refers to the fact that the reforming chamber 11 is divided by the hydrogen separating membrane to form the separated gas chamber therein. While the latter proposition is correct, as can be seen from an inspection of Figure 1, the separated gas chamber does not contain a catalyst material. In fact, its function is simply to collect the hydrogen gas which passes through the membrane 13, and the only "chamber" which contains the catalyst 12, is that formed by the left-hand side of the reforming chamber 11.

More importantly, however, it is also true, as acknowledged in the Office Action, that Isomura et al does not disclose (either expressly or by inference) that the area of the evaporation unit in which evaporation of the liquid starting materials substantially takes place "is at least partially surrounded by the plurality of chambers". Apart from the fact that there is no a "plurality of chambers" in Isomura et al, insofar as the reference discloses, the interface between the vaporization 10 and the reforming chamber 11 is planar, as depicted in Figure 2. Nothing in the specification suggests otherwise. Accordingly, Isomura et al fails to teach or suggest that the area of the evaporation unit where evaporation takes place is "at least partially surrounded by the plurality of chambers", each of which chambers comprises a catalyst material as recited in

Claims 1 and 15. Moreover, the interface between the evaporation unit and the reaction chamber is not three dimensional as recited in Claim 15.

The latter omission in Isomura et al is said to be taught in the Schuessler et al reference. Schuessler et al discloses a reforming reactor which includes an evaporator body "that adjoins the reaction zone in a flush manner", as indicated in the abstract. More specifically, as shown in the drawing figure, (which is a lengthwise section through the reactor unit), the evaporator layer 1 is adjacent to a catalyst layer 2, and the interface between the two is planar. This feature is confirmed by the specification at Column 3, lines 36-38, which states that the "evaporator body...abuts the reaction zone two-dimensionally". It is also possible, that the catalyst layer 2 is formed by a porous metallic matrix, with the evaporator layer 1 and the catalyst layer 2 being formed by a single continuous porous matrix, as noted in the specification at Column 5, lines 13-15.

As shown in the figure, in the Schuessler et al device, a plurality of feed channels 6,7 are provided for supplying liquid and gaseous components to the evaporator layer 1. In particular, the feed channels 6 supply a mixture of liquid methanol and water, while the channels 7 supply air or another oxygen containing gas. It is important to note in this regard that neither the feed channel 6 nor the feed channel 7 contains any catalyst material at all, nor are

those channels adjacent to the catalyst layer 2, which is separated from them by the evaporator layer 1.

In addition, a plurality of outlet channels are provided at the side 9 of the catalyst layer 2, for collecting the reacted reformate gas. Nothing contained in Schuessler et al teaches or suggests that the interface 9 between the catalyst layer and the outlet plate 8 (which includes the outlet channels 10) is anything other than planar, or two-dimensional, as indicated at Column 3, lines 36-38. Accordingly, it is apparent that the evaporation unit 2 is not "at least partially surrounded by" a plurality of chambers which comprise or contain a catalyst material, as recited in Claims 1 and 15.

The Office Action at page 3 states that the common evaporation unit (evaporation layer 1) in Schuessler et al is in thermally conductive contact with a plurality of chambers, referring to the feed channels 6,7. However, the feed channels 6,7 neither contain nor comprise, nor are they adjacent to, a catalyst material, since they are separated from the catalyst layer by the evaporation layer 1. While the outlet channels 10 in the outlet plate 8 are adjacent to the catalyst layer 2, it is clear that they do not surround the evaporator layer, nor are they in thermal contact with it. Accordingly, nothing contained in Schuessler et al teaches or suggests an arrangement in which an area of the evaporation unit in which evaporation of the liquid starting materials substantially takes

place is at least partially surrounded by the plurality of chambers, as recited in Claims 1 and 15. Moreover, Schuessler et al contains no disclosure which teaches or suggests a modification of Isomura et al to replicate the apparatus of Claims 1 and 15, nor is it apparent how such a modification would take place, given the substantial differences in the structure of the two devices. In addition, no rationale has been articulated for such a modification, and given the structure and direction of gas flow in Schuessler et al, if it were somehow incorporated into Isomura et al, no heat would flow from the chambers 10 to the evaporation layer, as is accomplished by the structure defined in Claims 1 and 15.

Claims 2 and 16 further recite that the evaporation unit is "entirely surrounded by the chambers", which according to Claim 1 comprise a catalyst. It follows from what has been said previously, that this feature of the invention is also neither taught nor suggested by either of the cited references.

Finally, Claims 7 and 8 recite that the evaporation unit is coupled to the plurality of chambers "such that the thermal coupling varies with a temperature gradient in the evaporation unit" (Claim 7) and furthermore that such coupling is "inversely proportional" to the temperature gradient. Neither reference contains any discussion which is directed to this matter, or which teaches or discusses the features of Claims 7 and 8. Accordingly, the latter claims further distinguish over the references for these additional reasons as well.

If there are any questions regarding this amendment or the application in general, a telephone call to the undersigned would be appreciated since this should expedite the prosecution of the application for all concerned.

If necessary to effect a timely response, this paper should be considered as a petition for an Extension of Time sufficient to effect a timely response, and please charge any deficiency in fees or credit any overpayments to Deposit Account No. 05-1323 (Docket #1748X/50407).

Respectfully submitted,

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